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EXAMINER	
TORRES, JUAN A	

ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 07/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/030,206	KENINGTON, PETER	
	Examiner	Art Unit	
	Juan A. Torres	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *51,54,57,62,65,68 and 73-90* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *51,54,57,62,65,68 and 73-90* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The modifications to the drawings were received on 06/17/2005. These modifications are accepted by the Examiner.

Response to Arguments

Applicant's arguments filed on 06/17/2005have been fully considered but they are not persuasive.

As per claims 51 and 62:

The Applicant contends, "Leyendecker teaches a lineariser for reducing distortion of an output signal of signal handling equipment (e.g., power amplifier 103) by processing a raw signal (e.g., the modulation signal) with data (e.g., the filter coefficients) selected from a store (e.g., LUT 603) in response to the amplitude (e.g., the instantaneous power or magnitude envelope) of the raw signal. Significantly, Leyendecker does not teach or even suggest that the filter coefficients are selected from LUT 603 in response to the frequency content of the modulation signal. As such, Leyendecker does not teach or even suggest all of the features recited in claim 51.".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Leyendecker in his patent titled "Frequency selective predistortion in a linear transmitter" discloses a lineariser for reducing distortion of an output signal of signal handling equipment by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal (figure 6 column 10 lines 16-39), The frequency content of the signal is clearly described in the cited section

when he mention a predistortion filter, that will be frequency dependent. As Leyendecker pointed out in that paragraph more detail of the frequency dependence is in fig. 12-13A where the frequency dependence is expressed as the very well known term "bin"; also in tables 1-3 it is expressed this dependence and how the LUT table is contracted in function of the bins (column 14 line 10 to column 18 line 57). For these reasons and the reason stated in the previous Office Action, the rejection of claims 51 and 62 are maintained.

The Applicant contends, "Meghdadi teaches a method for simulating a nonlinear amplifier, but has nothing to do with reducing the distortion generated by such an amplifier. As such, Meghdadi does not provide the teachings missing from Leyendecker. For all these reasons, the Applicant submits that claim 51 is allowable over the cited references. For similar reasons, the Applicant submits that claim 62 is allowable over the cited references. Since claims 54, 57, 65, and 68 depend variously from claims 51 and 62, it is further submitted that those claims are also allowable over the cited references. The Applicant submits therefore that the rejections of claims under Sections l02(e) and 103(a) have been overcome."

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, the rejections are based on 102 with only one reference. Because the rejection of claims 51 and 62 are maintained, the rejections of claims 54, 57, 65, and 68 are also maintained.

As per claims 54 and 65:

The Applicant contends, "According to column 11, lines 34-59, Fig. 8 shows a predistortion filter 800 having multiple LUTS 8061-806. Significantly, however, these different LUTS do not correspond to different frequencies or different bands of frequencies in the modulation signal. Rather, they correspond to different memory effects, such as actual past power or magnitude envelope signals rather than the average of past power or magnitude envelope samples, or such as different filtered averages of past sample power or magnitude. See column 11, lines 5 1-59. Significantly, as explicitly shown in Fig. 8, each LUT is addressed using the same table address, which is based solely on the power or magnitude envelope of the modulation signal. This is very different from claim 54, where each LUT corresponds to a different frequency or band of frequencies and each LUT is addressed using the amplitude of a different component of the raw signal corresponding to a different frequency or band of frequencies.".

The Examiner disagrees and asserts, that, as indicated in the previous Office Leyendecker discloses that the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table (figure 8 and figure 12 column 14 lines 16-34). The frequency content of the signal is clearly described in the cited section when he mentions a predistortion filter, that will be frequency dependent. As Leyendecker pointed out more detail of the frequency dependence is in fig. 12-13A where the frequency dependence is expressed as he very

well known term "bin"; also in tables 1-3 it is expressed this dependence and how the LUT table is contracted in function of the bins (column 14 line 10 to column 18 line 57). For these reasons and the reason stated en the previous Office Action, the rejection of claims 54 and 65 are maintained.

As per claims 57 and 68:

The Applicant contends, "According to column 13, lines 35 et seq., Fig. 12 shows trainer 431, where block 1201 of trainer 431 is a solver that generates the complex parameters used to update the LUT of the predistorter. See, e.g., column 13, line 66, to column 14, line 1. Nowhere in Leyendecker is there a teaching that solver 1201 or trainer 431 or, for that matter, any other component divides the modulation signal into a number of components having different frequencies or bands of frequencies. Note that the "bins" referred to in column 14 correspond to different quantized samples of the modulation signal and have nothing to do with the frequency content of the modulation signal.".

The Examiner disagrees and asserts, that, as indicated in the previous Office Leyendecker discloses a divider for dividing the raw signal into a number components having different frequencies or bands of frequencies (figure 12 block 1201 column 14 lines 16-34). As Leyendecker pointed out in his patent titled "***Frequency selective*** predistortion in a linear transmitter", more detail of the frequency dependence is in fig. 12-13A where the frequency dependence is expressed as he very well known term "bin".

Each bin is a sample in the frequency domain, so it represents a frequency (see US Patent 6674324 column 19 lines 4-22) of the signal at that frequency. This is very clear when Leyendecker indicates in table 2 how each frequency or bin is distortionated by the predistortion filter j-th bin f_j.

A filter is a "device that transmit a selective range of frequencies" (see Newton's Telecom Dictionary Ed 10th page 336). It is very well known that a filter will change in the frequency domain the amplitude of the signal.

In column 14 lines 10-34 Leyendecker states: "In one embodiment of the solver 1201, it first performs interpolation to increase the number and time resolution of the samples used in the training. In one embodiment, this interpolation is used to achieve, in effect, a 48M samples/second sampling rate. This interpolation has been found to improve the linearization of the transmitter output signals. The trainer 431 then quantizes the samples into "bins" that are equal in number to the number of table addresses in the predistorter LUT". So these samples are the number of frequencies that the system is monitored. Furthermore "In the preferred embodiment, the validator 1203 checks that there are enough data samples in a bin and that their distribution is statistically significant (i.e., not too much variation). If the values associated with a bin are qualified by the validator 1203, then the average of these values is calculated to derive a new complex parameter value for each bin. For example, in one embodiment, a least squares method is used to determine an average value of the complex parameter for each bin. The calculated values for each bin can then be used to update the predistorter LUT. In a further refinement, each calculated parameter can be averaged or

filtered with the corresponding previously trained parameters (or, alternatively, a weighted average of previously trained parameters) to generate the updated parameter. This averaging is used to smooth out changes in the parameter and to get a better parameter estimate. This value can then be used to update the predistorter LUT".

Furthermore Leyendecker (column 14 lines 35-61) indicates that "In the qualification process, the validator 1203 checks each parameter value to determine whether each parameter value is reliable. Each reliable parameter is then stored at the corresponding address of the predistorter's LUT (i.e., at the address defined by the address generator for the quantized modulation signal sample). ***In addition, any parameters calculated for bins having a number of samples below a predetermined threshold are discarded, resulting in empty bins. The interpolator/extrapolator 1205 then determines the parameters of the empty bins (if any) by interpolation or extrapolation from the other surrounding bins***. Then the averager 1207 averages each calculated parameter with the corresponding parameter currently stored in the predistorter LUT. When averaging a calculated parameter with the corresponding current parameter in the predistorter LUT, the trainer reads the contents of the predistorter LUT into the trainer. Similarly, when averaging a calculated parameter with a weighted average of past parameters, the trainer may include a memory array storing the running weighted average. These averaged values are then used to update the predistorter LUT. In this embodiment, the solver, validator, interpolation/extrapolation and averaging functions are implemented in the TMS320C44 DSP microprocessor and associated memory (not shown) using techniques well known

in the art of digital linear transmitters. The operation of the trainer 431 is described further below in conjunction with FIGS. 13 and 13A". So each bin is a frequency and in the table is the predistortion value at that frequency (Predistortion ***filter***).

Tables 1-3 it is expressed this dependence and how the LUT table is contracted in function of the bins (column 14 line 10 to column 18 line 57). For these reasons and the reason stated en the previous Office Action, the rejection of claims 57 and 68 are maintained. These references are provided for clarification and are not use for art rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 51, 54, 57, 62, 65 and 68 are rejected under 35 U.S.C. 102(e) as being anticipated by Leyendecker (US 5867065).

As per claim 51 Leyendecker discloses a lineariser for reducing distortion of an output signal of signal handling equipment by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal (figure 6 column 10 lines 16-39).

As per claim 54 Leyendecker discloses that the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table (figure 8 and figure 12 column 14 lines 16-34).

As per claim 57 Leyendecker discloses a divider for dividing the raw signal into a number components having different frequencies or bands of frequencies (figure 12 block 1201 column 14 lines 16-34).

As per claim 62 Leyendecker discloses a method for reducing distortion of an output signal of signal handling equipment the steps of selected from a store in response to the amplitude and frequency content of the raw signal (figure 6 block 603 column 10 lines 16-19), and using the data in distortion reduction processing of the raw signal (figure 6 block 603 column 10 lines 19-39).

As per claim 63 Leyendecker discloses that the data comprises coefficients and the distortion reduction processing comprises modification of the raw signal using the coefficients (Figure 6 column 10 lines 16-39).

As per claim 64 Leyendecker discloses that the modification to the raw signal comprises multiplication of coefficients with amplitude values of the raw signal (Figure 11 column 12 lines 41-49).

As per claim 65 Leyendecker discloses that the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients,

each coefficient associated with a value of the amplitude of the component of the table (figure 8 and figure 12 column 14 lines 16-34).

As per claim 66 Leyendecker discloses the step of retrieving coefficients from the group of look-up tables on the basis of amplitude values of and frequency content of components of the raw signal (figure 12 block 1201 column 13 line 66 column 14 line 9).

As per claim 67 Leyendecker discloses the step of interpolating coefficients for amplitude and/or frequency values which do not have an associated coefficient in the group of look-up tables (figure 12 block 1205 column 14 lines 43-45).

As per claim 68 Leyendecker discloses the step of dividing the raw signal into a number components having different frequencies or bands of frequencies (figure 12 block 1201 column 14 lines 16-34).

As per claim 70 Leyendecker discloses the step of a combining components of the raw signal having different frequencies or bands of frequencies to form a reassembled signal (figure 12 block 1207 column 14 lines 45-48).

As per claim 71 Leyendecker discloses the step of adapting the data in the store to compensate for changes in the distortion characteristics of the signal handling equipment (figure 6 block 607 column 10 lines 22-32).

As per claim 72 Leyendecker discloses that the adapting step comprises the step of monitoring feedback from the output of the signal handling equipment (figure 6 block 613 and figure 15 block 1026 column 20 lines 19-21).

Claims 73-90 are rejected under 35 U.S.C. 102(e) as being anticipated by Wright (US 6798843).

As per claims 73 and 82, Wright discloses a method and apparatus for reducing distortion in an output signal generated by signal handling equipment, the method comprising: dividing a raw signal into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies (column 2 lines 25-37 and lines 60-66; figure 3 and 8 block 52A, column 16 line 52 to column 17 line 45; column 15 line 54 to column 16 line 26; figures 18 and 19 column 31 lines 21-26); generating a modified component for each raw component based on the amplitude of the raw component (figures 1 and 8 block 52A column 15 line 54to column 16 line 26); and combining the plurality of modified components to generate a modified signal (figures 1 and 8 block adder vd(t) column 15 line 54 to column 16 line 26).

As per claims 74 and 83, Wright discloses claims 73 and 82. Wright also discloses that the signal handling equipment is an amplifier adapted to amplify the modified signal (figures 1 and 8 block 60 column 10 lines 11-27); and the modified signal is generated by applying pre-distortion to the raw signal, wherein the pre-distortion reduces the distortion in the output signal generated by the amplifier (figures 1 and 8 block 52 column 8 lines 54-67).

As per claims 75 and 84, Wright discloses claims 73 and 82. Wright also discloses applying different copies of the raw signal to a plurality of band-pass filters to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies (figures 1 and 8 block 52A column 15 line 54 to column 16 line 26); and

summing the plurality of modified components to generate the modified signal (figures 1 and 8 block adder vd(t) column 15 line 54 to column 16 line 26).

As per claims 76 and 85, Wright discloses claims 73 and 82. Wright also discloses transforming the raw signal from a time domain to a frequency domain to generate the plurality of raw components (figure 25A column 36 lines 19-42); and transforming the plurality of modified components from the frequency domain to the time domain to generate the modified signal (figure 20 column 31 lines 27-54).

As per claims 77 and 86, Wright discloses claims 73 and 82. Wright also discloses retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component (figure 15-17 column 28 line 48 to column 29 line 17); and each different frequency or band of frequencies has its own LUT (figure 15-17 column 28 line 48 to column 29 line 17).

As per claims 78 and 87, Wright discloses claims 77 and 86. Wright also discloses adaptively updating values stored in each LUT (figures 21-23 column 31 line 55 to column 35 line 15).

As per claims 79 and 88, Wright discloses claims 78 and 87. Wright also discloses generating a feedback signal based on the output signal of the signal handling equipment (figures 1 and 2 block vf(t) column 7 line 34 to column 11 line 20); dividing the feedback signal into a plurality of feedback components, each feedback component corresponding to a different frequency or band of frequencies (figures 15-19 block 76 column 29 line 40 to column 31 line 54); generating, for each frequency or band of

frequencies, an update value for the corresponding LUT based on the corresponding raw component and the corresponding feedback component (figure 15-19 block 78 column 29 line 40 to column 31 line 54); and updating each LUT based on the corresponding update value (figures 21-23 column 31 line 55 to column 35 line 15).

As per claims 80 and 89, Wright discloses claims 79 and 88. Wright also discloses applying the corresponding raw component and the corresponding feedback component to a divider to generate the corresponding update value (figures 1 and 2 block 52 column 7 line 34 to column 11 line 20).

As per claims 81 and 90, Wright discloses claims 80 and 89. Wright also discloses integrating, over time, outputs from the divider to generate the corresponding update value (figure 15-19 block 88 column 29 line 40 to column 31 line 54).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Juan Alberto Torres
06-27-2005

KEVIN BURD
PRIMARY EXAMINER